

Leftovers

You need:

a partner

1 die

15 color tiles

1 cup to hold the tiles

6 3-inch paper squares ("plates")

1. Take turns. On your turn, roll the die, take that number of paper plates or squares, and divide the tiles among them. Keep any leftover tiles.
2. Both players record the math sentence that describes what happened.

For example: $15 \div 4 = 3 \text{ R}3$

In front of each sentence, write the initial of the person who rolled the die.

3. Return the tiles on the plates to the cup before the next player takes a turn.

Leftovers, continued

4. Play until all the tiles are gone. Then figure your scores by counting how many tiles each of you has. The winner is the player with the most leftovers. Add your scores to make sure that they total the 15 tiles you started with.
5. When you finish a game, look at each of your sentences with a remainder of zero (R0). Write on the class chart each sentence with R0 that isn't already posted.

CHAPTER FIVE

THE GAME OF LEFTOVERS

Overview

This game of chance gives children experience using the sharing model of division to divide quantities of color tiles into equal groups and think about remainders. Starting with fifteen tiles, the children play in pairs and take turns rolling a die, sharing the tiles among that many groups and keeping the tiles that are left over. They record a division equation for each roll. Children extend the game by creating their own dice and choosing how many tiles they wish to start with.

Materials

- ▲ dice, 1 per pair of students
- ▲ 1-inch color tiles, 15 per pair of students
- ▲ paper cups or other containers to hold 15 color tiles
- ▲ 3-inch squares of construction paper, 6 per pair of students
- ▲ chart paper, 1 sheet
- ▲ blank cubes, plus sticky labels for dice, 1 per pair of students (for extensions)
- ▲ optional: rules for playing the game of *Leftovers* to distribute to students (see Blackline Masters)

Time

- ▲ two class periods, plus additional time for repeated play and extensions

Teaching Directions

1. Tell the students that you're going to teach them how to play *Leftovers*, a game for partners. Show them the materials: a die, fifteen color tiles in a cup, and 3-inch squares of construction paper (called "plates").

2. Write the directions on the board or an overhead transparency or distribute a copy to each pair of students.

Leftovers

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- 1 die
- 15 color tiles
- 1 cup to hold the tiles
- 6 3-inch paper squares ("plates")

1. Take turns. On your turn, roll the die, take that number of paper plates or squares, and divide the tiles among them. Keep any leftover tiles.
2. Both players record the math sentence that describes what happened.

For example: $15 \div 4 = 3 \text{ R}3$

In front of each sentence, write the initial of the person who rolled the die.

3. Return the tiles on the plates to the cup before the next player takes a turn.
4. Play until all the tiles are gone. Then figure your scores by counting how many tiles each of you has. The winner is the player with the most leftovers. Add your scores to make sure that they total the 15 tiles you started with.
5. When you finish a game, look at each of your sentences with a remainder of zero (R0). Write on the class chart each sentence with R0 that isn't already posted.

3. Choose a student to model a game with you. Begin by asking your student partner to count out fifteen tiles. Decide who goes first.

4. The player who goes first rolls the die. This determines how many plates to lay out. So that the class can see what's happening in this model game, draw on the board the appropriate number of squares for each round.

5. The player who rolled the die then divides the total number of tiles in the cup into equal shares on the plates. He or she gets to keep all the leftover tiles for that round. Both players write a mathematical sentence to represent the division; for example, $15 \div 4 = 3 \text{ R}3$ or $15 \div 3 = 5 \text{ R}0$. During the demonstration, both you and your partner should record on the board so the others can see. (Having both players record gives all children practice writing the standard notation for division. Also, while including R0 if there is no remainder isn't conventional or essential, it is helpful to some children.) The first player hands the die to the second player at the end of the turn.

6. Return the tiles on the plates to the cup. The second person rolls the die, takes the correct number of plates, and divides up the tiles. Both players record again. The second player hands the die back to the first player at the end of the turn.

7. Continue playing until no tiles are left. If necessary, explain to students what to do if the number of plates exceeds the number of tiles. (See the "Teaching Notes" section for an explanation of this point.)

8. The winner is the player with the most leftovers. Check that all the leftovers total the original fifteen.

9. After you finish modeling the game, post the sheet of chart paper. Title it *Division with R0* and list the sentences from the board that have remainders of zero. (Do not write duplicates.) Tell the students that after they finish a game of *Leftovers*, they should record on the chart their sentences that have a remainder of zero. Remind them that they should check to make sure they write sentences that are not already on the chart.

10. Have students play the game in pairs. Circulate and check that they understand the rules and are playing correctly.

11. Begin class the next day with a class discussion about the game. Ask: "Which numbers were easy ones for getting remainders? Which were hard?" Students might have discovered that they got "stuck" on some numbers such as twelve, for which only one number (five) has any remainders. Also, with the class, examine the class chart of division sentences with remainders of zero and have the children look for patterns. For example, looking at the sentences that begin with ten ($10 \div 1 = 10$, $10 \div 2 = 5$, $10 \div 5 = 2$) may help children see that factors of a number can be used in two division statements. Also, children might notice that dividing by one produces the same answer as the number they started with.

Teaching Notes

The game of *Leftovers* provides students experience with the sharing model of division. The total number of tiles is known, the number of groups is known, and the unknown is the number of tiles in each group.

The game also focuses students' attention on remainders, or leftovers. Many students this age believe that something is "wrong" if there are leftovers. By playing the game, students see that leftovers in division are inevitable and make sense. Students also gain an understanding of what causes leftovers, or remainders, to occur.

As the students near the end of the game, it's likely that they will roll a number resulting in a greater number of plates than tiles. For example, there may be two tiles left and they roll a 4. Within the context of the tiles, it's impossible to place an equal number of tiles on each plate as there are only two tiles and four plates. So there are zero on each plate and the two tiles are leftovers. The mathematical sentence is $2 \div 4 = 0R2$.